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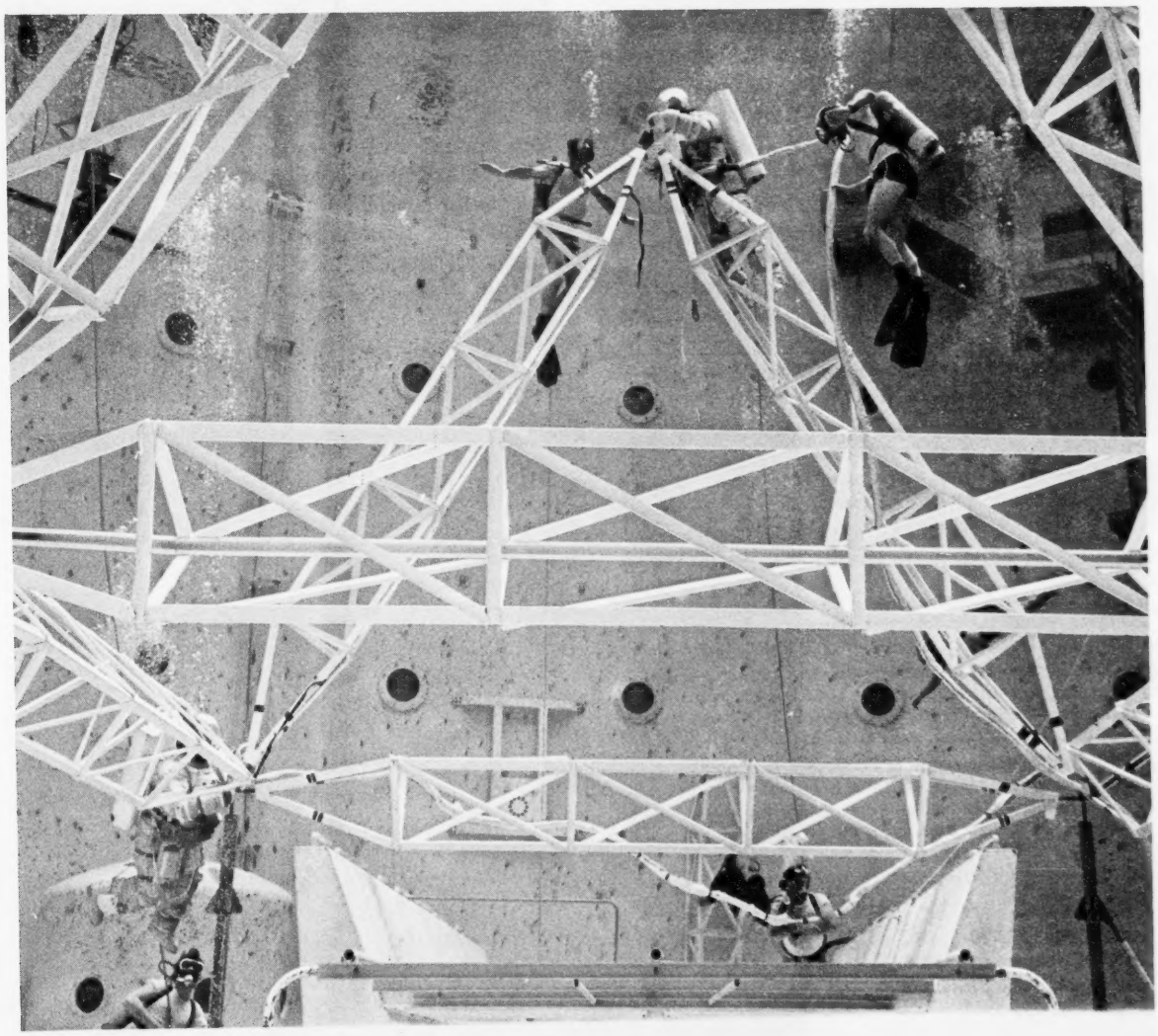

Cover

Divers Investigating Space Structures—Two engineers wearing space suits (center top and lower left) perform one of a series of tests in space structure assembly in the simulated weightlessnes of the neutral buoyancy simulator at the Marshall center. Four divers, present for safety and assistance are visible at top and bottom of photo. The test being performed deals with assembly techniques for space structures and determining the problems that may be encountered in handling and moving large beams in space. Some 60 observers—attendees at the Marshall large space structures conference—watched the activities.

Correction—"Chronology of Russian Space Feat" on page 26, *Activities* for May 1978 contained a typographical error. First line should read: "The record-breaking 96-day . . ."

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Far Ranging Pioneer Venus 1 Launched

NASA launched the first of two spacecraft toward Venus last month for a detailed scientific study of that cloud-shrouded planet. Pioneer Venus 1 was launched May 20 from NASA's Kennedy Space Center atop an Atlas Centaur rocket. The second spacecraft, Pioneer Venus 2, will be launched toward the planet three months later, about Aug. 7.

Pioneer Venus 1, an orbiter, will reach Venus on Dec. 4, 1978, and Pioneer Venus 2, a multiprobe spacecraft, will arrive five days later after splitting into a bus and four atmospheric entry probes, 13 million kilometers and 20 days out from the planet.

The flights may shed new light on some of the most puzzling questions in planetary science, such as:

- Why do two planets—Earth and Venus—of about the same mass, probably formed from similar materials and situated at comparable distances from the Sun, have atmospheres that have evolved so differently?
- Why is the surface of Venus baked by a searing heat, while Earth luxuriates in a climate conducive to life?

The answers to both questions depend on an understanding of the factors that govern the evolution of a planet's atmosphere. Information gathered by the two instrument-laden Pioneers at Venus also may help us learn more about the forces that cause the weather on our own planet.

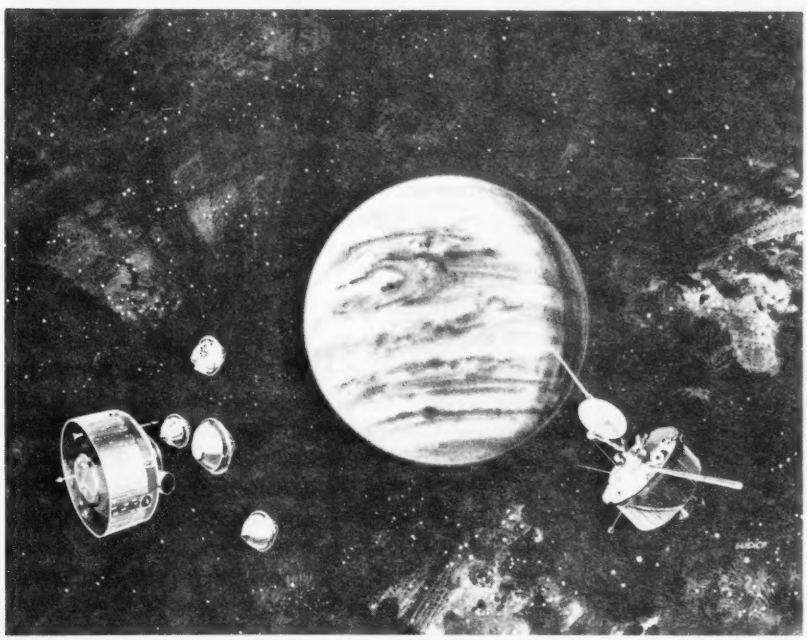
The Pioneer Venus flights are the first ones devoted primarily to a study of the atmosphere and weather of another planet on a global scale. They will employ the largest number of vehicles ever used in such studies, and make measurements at the greatest number of locations.

The flights also will seek additional knowledge about the characteristics of Venus' upper atmosphere and ionosphere, as well as the lower atmosphere. They will study the interactions of these regions with the solar wind—the continuous stream of ions and electrons flowing outward from the Sun—and the solar magnetic and electric fields.

Circling the planet for at least eight months, the Pioneer Venus orbiter will make the longest observations yet of Venus. It will be the first U.S. spacecraft to orbit the planet.

To reach Venus, the orbiter will fly more than halfway around the Sun on its seven-month journey, some 482.8 million km, traveling outside the Earth's orbit for the first three months, and inside it for the last four months. This wide-swinging flight path will allow a slower approach to the planet, permitting a smaller orbital insertion motor and more spacecraft weight.

At Venus, the orbiter will follow a highly inclined (75-degree), 24-hour orbit planned so that spacecraft events coincide with those on Earth. At periapsis (orbital low point), the spacecraft will dip as low as 150 km altitude, as it enters Venus' thin upper atmosphere. Its orbital high point or apoapsis will be



Approach to Venus—Pioneer Venus 1 orbiter is shown at right of the planet as it nears the surface; Pioneer 2 multiprobe spacecraft (to arrive five days after Pioneer 1) is seen after it has divided into a bus and four atmospheric entry probes. In this artist's concept, the multiprobe is some 13 million kilometers and 20 days from impact. The orbiter is expected to collect mountains of data as it circles Venus for 243 days.

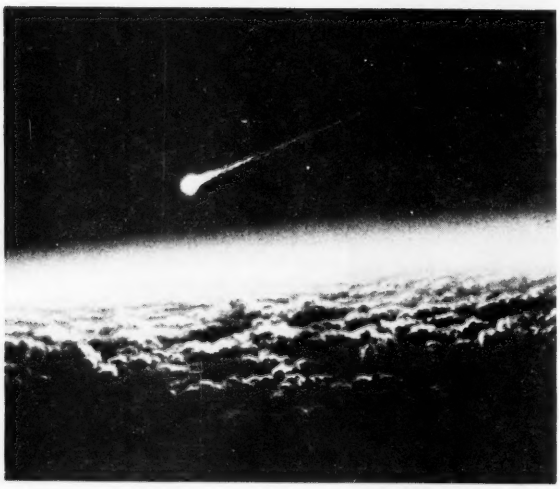
66,600 km from the planet. The orbiter will take daily pictures in ultraviolet light of Venus' clouds for studies of their four-day rotation.

Experimenters will use precise orbit measurements to chart Venus' gravity field for calculation of planetary shape and density variations. The 12 orbiter scientific instruments will make a variety of other remote-sensing and direct measurements of the planet's atmosphere and surrounding environment.

The orbiter's primary mission of eight months in the orbital Venus will cover one complete rotation of Venus on its axis, which equals 243 Earth days. Venus circles the Sun in 225 days.

The orbiter's companion spacecraft, the multiprobe, is made up of a transporter bus, a large probe and three identical smaller probes. These spacecraft, including the bus, traveling about 10,000 km apart will enter at points spread over the entire hemisphere of Venus that faces Earth. The bus will obtain data on the composition of the upper atmosphere before burning up. The other four probes will measure the atmosphere from top to bottom as they fly down to Venus' searing surface. The probes are not designed to survive after impact.

Scientists believe that these coordinated atmospheric missions combined with similar ones to Mars, Jupiter and other planets, will lead to a better understanding of atmospheric mechanisms in general. Studies of the interactions of temperatures, pressures, composition, clouds and atmospheric dynamics different from Earth's should provide insights into important mechanisms which are often prominent on just one planet.



Nearly at its Destinaton—How an artist sees the Pioneer Venus transporter probe just before it flares into the atmosphere over Venus.

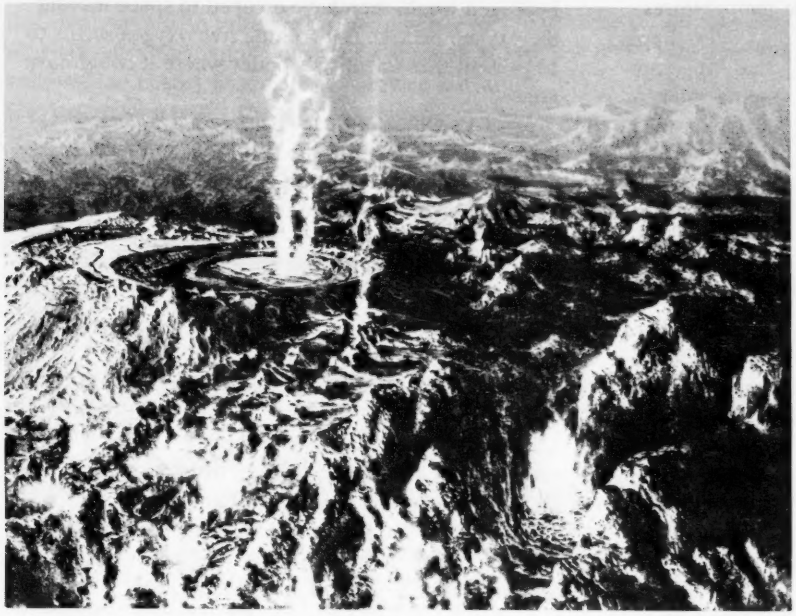
Scientists think Venus may be an unusually good place to study the mechanics of atmospheres because the planet rotates slowly and there are no oceans. The atmosphere appears to be a relatively "simple" weather machine, and the important atmospheric circulation motions appear to be global. Hence, continuous measurements from orbit, combined with those of the probes from many points in the atmosphere, would provide at least a rough picture of Venusian weather processes.

The orbiter spacecraft, like the multiprobe bus, consists principally of a spin-stabilized, 2.4 meter diameter, flat cylinder containing most spacecraft systems. Above the cylinder, on a 1-m mast aligned with the spin axis, is the despun, narrow-beam, parabolic dish antenna. The dish is used for high-speed data transmission and faces toward the Earth throughout the mission, while the spacecraft spins beneath it. Within the cylinder is a thermally controlled equipment compartment, which houses the 12 orbiter scientific instruments, a million-bit data memory and the communications and data-handling systems. Other orbiter systems are the Sun and star sensors for spacecraft orientation; thrusters to make spinrate, orientation and course corrections; the solid-fuel orbital insertion motor; and the battery and power system. The exterior of the cylinder is coated with power-generating solar cells. A 4.6-m boom extends radially outward to place two magnetometer sensors beyond spacecraft magnetic fields.

The orbiter's launch weight is about 580 kilograms with 45 kg of scientific instruments. Weight in orbit after motor burn will be 372 kg.

The orbiter's destination, Venus, is the second planet from the Sun, and the closest one to Earth. Because of its highly reflective cloud cover, Venus is the brighest object in the sky after the Sun and the Moon. Its mean distance from the Sun is 108.2 million km—nearly three-quarters the distance of Earth from the Sun.

When Venus is closest to Earth, directly between Earth and Sun, the planet is only 42 million km away. Earth and Venus are almost twins in size and mass, but are extremely different in other ways: Earth is a water-rich planet on which life thrives; Venus is a dry and desolate world, apparently without life. Scientists want to know how two such outwardly similar planets can evolve so differently and if there is any chance of Earth becoming like Venus.



Venus' Scalding Environment—Scientific evidence indicates that Venus' surface temperature is hotter than the melting points of lead and zinc, perhaps 470 degrees C. This artist's version could be what Pioneer Venus imagery will record when the probes have nearly reached impact point.

A Probe after Landing—Although the instruments aboard the probes are expected to be inoperative once the various Pioneer Venus vehicles land on Venus, some may survive, may even be able to transmit signals for a few seconds after they have entered the torrid atmosphere of the planet. Should any survive after impact, they might look like this artist's view of a sounder probe after landing.

Available evidence suggests that Venus has a dramatically rugged surface, but is less mountainous than either Earth and Mars. Its surface temperature is hotter than the melting points of lead and zinc, about 470 degrees C, and the atmospheric pressure is about 100 times that of Earth. Surface features on Venus can never be seen because of its permanent cloud cover. The atmosphere of Venus appears to be predominantly carbon dioxide—about 97 percent—and tiny amounts of water vapor have been detected in it.

Venus has no significant magnetic field, therefore the planet's upper atmosphere interacts directly with the solar wind. Venus is one of the three planets in our solar system with no moons, the others being Mercury and Pluto. The mass, diameter and mean density of Earth and Venus are almost identical. Venus' high overall density suggests a dense core something like Earth's nickel-iron core.

Although Venus receives almost twice as much solar radiation as Earth, if this solar heat were not

trapped by its atmosphere, habitable temperatures would exist at the planet's polar regions. This trapping is called a greenhouse effect, meaning that the atmosphere on Venus allows passage of incoming solar radiation, but restricts radiation of heat outward. The temperature at the poles of Venus is only about 10 degrees C less than that at the equator and its day and night hemispheres have the same temperature. Hence, Venus' massive atmosphere contains circulation mechanisms which distribute solar heat evenly over the whole planet.

In addition to carbon dioxide and water traces, the atmosphere on Venus also has some quantities of carbon monoxide, hydrochloric acid and hydrogen fluoride. Venus' permanent clouds, which are tenuous somewhat like terrestrial smog, are almost twice as deep as Earth's cloud layer (about 18 km thick) and are believed to be composed mainly of sulfuric acid droplets.

Somewhere below the bottom of the main cloud layers, the temperature becomes great enough for the sulfuric acid droplets to evaporate into water vapor and sulfuric acid vapor. A clear atmosphere results. Enough sunlight pierces the clouds so that the surface appears as bright as it might on an overcast day on Earth.

The Mariner cloud photographs in ultraviolet light suggest that the stratosphere of Venus is in continuous high-speed motion. The clouds seem to move about 360 km/hr, circling the planet in four Earth days. The Soviet Venera landers photos, however, showed that wind speeds in the deep atmosphere are extremely slow. In the region between atmosphere top and bottom, wind velocity seems to change abruptly at about 56 km above the surface, between the base of the clouds and the clear atmosphere below.

Some of the major questions relating to Earth and Venus are:

- Like Venus, the Earth has a "greenhouse effect" which appears to be growing owing to increases in carbon dioxide in our atmosphere. These increases come from large-scale burning of fossil fuels since 1850. Could the Earth's greenhouse effect become strong enough to cause serious, permanent rises in temperature?
- Since Venus presumably formed as near to Earth as it is today, we might expect Venusian oceans like our own. Yet there is almost no water on Venus. Where did the water go, if it ever existed? One theory is that the intense heating on Venus vaporized any oceans, and forced water vapor into the stratosphere. There the vapor would have split into hydrogen and oxygen by solar ultra-violet radiation. The lightweight hydrogen would then have escaped to space leaving the oxygen behind. But so little free oxygen seems to be present that scientists wonder where it could have gone.

NASA's Office of Space Science has assigned project management of the two Pioneer Venus spacecraft to the Ames Research Center and the spacecraft will be controlled continuously from the mission operations center at Ames. The spacecraft were built by Hughes Aircraft Co., El Segundo, Calif., and the scientific instruments were supplied by NASA centers, other government organizations, universities and private industry.

The spacecraft will be tracked by NASA's Deep Space Network, operated by the Jet Propulsion Laboratory; NASA's Lewis Research Center is responsible for the launch vehicle, which was built by General Dynamics, San Diego, Calif.

Cost of the two Pioneer Venus spacecraft, scientific instruments, mission operations and data analysis is about $175 million. This does not include cost of launch vehicles and tracking and data acquisition.

Launch period for the Mutiprobe flight extends from Aug. 7 to Sept. 3, 1978.

Newly Appointed Associate Administrator

Dr. William C. Schneider, Deputy Associate Administrator for space transportation systems, recently was named NASA's Associate Administrator for space tracking and data systems. In his new job, Schneider will be responsible for planning, development and operation of global tracking networks, facilities and systems for communication and data acquisition, and processing for all NASA space flight programs.

He joined NASA in June 1963, after two years as director of space systems at International Telephone and Telegraph Company's Federal Laboratories in Nutley, N.J. Earlier, he worked for the U.S. Navy and the National Advisory Committee for Aeronautics, NASA's predecessor agency.

Schneider was mission director and deputy director of the Gemini program for seven of the 10 manned Gemini missions for which he received NASA's Exceptional Service Medals. From July 1967 to December 1968, Schneider served as Apollo mission

director and Apollo program deputy director for missions, directing Apollo missions 4 through 8. He received the NASA Distinguished Service Medal for his contribution to the success of Apollo 8, man's first flight around the Moon.

Schneider served as Director of the Skylab program from December 1968 until he was named Deputy Associate Administrator for manned space flight in July 1974. His Skylab responsibilities included directing the development, launch and operation by three crews of astronauts of the naton's first space station, the Skylab workshop. His work won him the NASA Distinguished Service Medal. In 1973, he not only was co-recipient (with the three Skylab astronaut crews) of the Collier Trophy, but also the Astronauts Engineer Award from the National Space Club and the American Astronautical Society's Space Flight Award.

Schneider was born in New York City in 1923. He received his B.S. in aeronautics from the Massachusetts Institute of Technology in 1949 and his M.S. in 1952 from the University of Virginia. He won his doctor of engineering in 1976 from Catholic University. He is an Associate Fellow of the American Institute of Aeronautics and Astronautics and a Fellow of the American Astronautical Society.

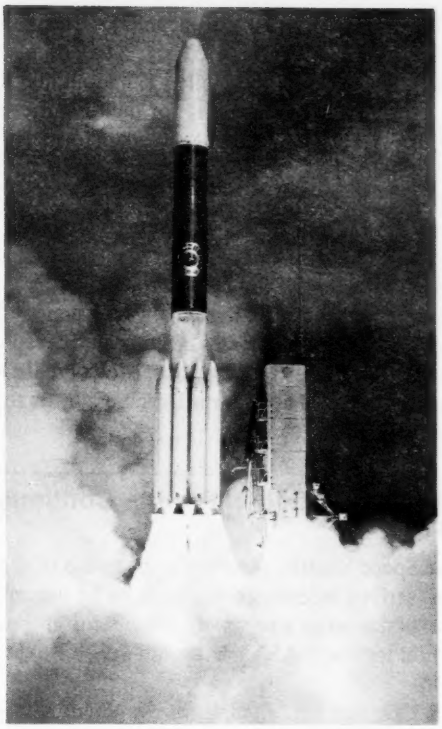
NASA Launches Test Satellite

A European communications satellite (Orbital Test Satellite or OTS-2), the forerunner of an operational system, was launched by NASA for the European Space Agency on May 11 from Cape Canaveral. The new type of communications spacecraft is one of two experimental models built by ESA to test the satellite's performance in orbit.

The spacecraft's operational descendents are expected to provide satellite links in the 1980's for routing portions of the intra-European telephone, telegraph and telex traffic as well as to provide television relay services for Western Europe.

Under a U.S.-ESA agreement, the satellite was launched by NASA's Delta rocket. ESA will reimburse NASA for the cost of the Delta launch vehicle, launch services and other administrative costs totaling $17 million.

The 865-kilogram OTS-2, will provide experimental and pre-operational traffic capability for one or two television channels and 2,000-5,000 telephone circuits. From the satellite's on-station position over West Africa at 10 degrees E. longitude above the equator, coverage includes all of Western Europe, the Middle East, North Africa, the Azores, Canary Islands, Madeira and Iceland.



The first OTS was launched by NASA on a Delta rocket Sept. 13, 1977, from Cape Canaveral, but the Delta first stage exploded 55 seconds after liftoff. The cause was traced to a probable burn-through of one of the solid propellant strap-on Caster IV motors, which is strapped around the bottom of the first stage Thor booster. The Castor IV motor subsequently has been modified by increasing the thickness of the insulation liner between the solid propellant and the exterior motor case.

OTS-2 was injected into a synchronous transfer orbit of about 36,081 kilometers apogee altitude, 185 km perigee and 27.4 degrees inclination. On the fourth apogee, roughly 36 hours after launch, when the spacecraft was over the mid-Atlantic, the apogee kick motor was fired to circularize the orbit. From there it was allowed to drift several degrees per day until it arrived at its initial on-station position at 10 degrees E. longitude above the equator.

The apogee kick motor firing was controlled from the European Space Operations Center (ESOC), Darmstadt, West Germany, which is responsible for all tracking and data recovery activities once the spacecraft reaches transfer orbit.

Launch vehicle tracking as well as early orbit spacecraft data were sent simultaneously to ESOC.

The spacecraft was built under the supervision of

ESA by industries in 10 European countries: Belgium, Denmark, France, Germany, Italy, Netherlands, Sweden, Switzerland, the United Kingdom and Spain. ESA gave direct responsibility for building the satellite to British Aerospace Dynamics Corp. (formerly Hawker Siddeley Dynamics), Great Britain, as prime contractor. The corporation was supported by a team of contractors from the other countries involved.

NASA's Goddard Space Flight Center provides technical direction of the Delta project for the Office of Space Transportation Systems. The Kennedy Space Center's expendable vehicles directorate is responsible to Goddard for launch operations. McDonnell Douglas Astronautics Co., Huntington Beach, Calif. is the prime contractor.

Extensive Testing of Shuttle Continues at MSFC

The Space Shuttle, America's spaceship of the future, arrived recently in Alabama to be assembled for the first time as a complete vehicle for ground vibration tests at NASA's Marshall Space Flight Center.

In a huge facility originally constructed for testing the Saturn V Moon rocket, engineers will evaluate the structural dynamics and their effect on the control system of the Shuttle.

The component parts needed to make the Shuttle complete—the orbiter, external tank and solid rocket boosters—were or will be transported from California, Louisiana, Utah and other locations. Testing has already begun and is expected to continue throughout most of the year.

Despite the term "vibration tests," the objective is not to measure the strength of the vehicle. Rather, engineers at the Marshall center will "float" the Shuttle in the center's tall test tower and apply vibrations to its exterior with exciters powered by amplifiers similar to those used on home stereo sets. Sensors placed along the skin at other locations record the characteristics of vibrations as they pass from area to area.

Test data will be used to verify the system design and mathematical models that predict how the Shuttles control system will react to the strong vibrations expected during launch and flight into orbit.

The first test article configuration will include the orbiter and external tank to simulate the high altitude portion of a Shuttle mission after the solid rocket boosters have separated. The liquid oxygen section of the external tank will be filled with smaller and smaller quantities of de-ionized water to simulate use of propellant by the main engines. The liquid hydrogen tank will be pressurized but empty.

For the second test, solid rocket boosters filled with inert propellants will be stacked in the stand along with the orbiter and tank, a configuration that simulates liftoff conditions. This will be the first stacking of all Space Shuttle components as they will appear for launch.

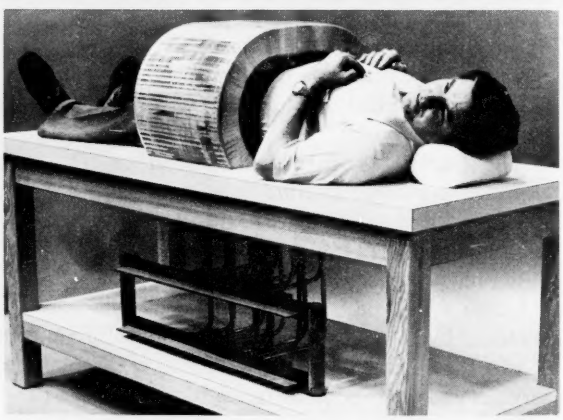
The third test configuration will be the same as the second except that the solid rocket boosters will be removed from the stand.

For actual flight, the boosters external tank and orbiter will be joined to form one unit. The boosters are attached to the sides of the tank and the orbiter is fastened on the tank between the boosters. The boosters provide thrusting power during the first two minutes of flight. The main engines, using propellants from the external tank, burn for about the first eight minutes of flight.

NASA's Johnson Space Center has responsibility for the orbiter and the integration of all elements into the final vehicle.

The Marshall center has the responsibility for design and development of the main engines, the external tank and the solid rocket boosters, and some major testing of the vehicle and its components.

NASA's Kennedy Space Center and the Vandenberg Air Force Base, Calif., have been selected as the Shuttle launch and landing areas.



Technology against Cancer—NASA's Jet Propulsion Laboratory scientists Glenn Haskins and Dr. David Elliott are assisting UCLA doctors in finding new methods for treating certain cancers. In this photo, Elliott demonstrates a technique under development which uses a magnetic field to focus intense heat on specific diseased organs, without damaging surrounding tissue or other parts of the body. The concept was developed by UCLA neurosurgeon Dr. Robert Rand and veterinary radiologist Harold Snow.

Indian Tribes Confer with Washington via CTS

American Indians in far western regions of the country used a sophisticated U.S.-Canadian communications tool, the world's most powerful communications satellite, in a most unusual undertaking in April.

Tribes in Montana and New Mexico used the satellite to communicate with each other and with Federal officials in Washington, D.C. The object of the venture was to discuss information and views on health, agriculture, education and other tribal concerns.

The experimental satellite, known as the Communications Technology Satellite, provides two-way interactive video and audio communication between ground sites. CTS operates in a new frequency band and at power levels 10 to 20 times higher than currently operating commercial communications satellites. Its key component, the transmitter, was developed by NASA's Lewis Research Center which is responsible for managing U.S. portions of the joint U.S.-Canadian satellite program.

Principal sending/receiving points during the three-and-a-half-day broadcast were the Indian Affairs facility at Crow Agency, N.M.; and NASA headquarters. Two California colleges—Humboldt State College and California University of Long Beach—joined the network through facilities of NASA's Ames Research Center.

Indian nations taking part in the broadcast were the Crow and other tribes from the northwestern part of the country and the All-Indian Pueblo Council, Inc., and nearby tribes from the Southwest. Their participation was led by tribal chairmen and council representatives from the Crow Agency area and governors from Indian communities in and around Albuquerque.

Among key government figures taking part were: Alex Mercure, Assistant Secretary of the Department of Agriculture; U.S. Senators Jack Schmitt and Pete Dominici, from New Mexico, U.S. Representatives Ron Marlene and Paul Hatfield, from Montana; Governor Thomas Judge of Montana; Special Assistant to the Vice President Nelson Diaz; Dr. Gerald Gipp, director, Office of Indian Education and Welfare; and Forrest J. Gerard, Assistant Secretary for Indian Affairs, Department of the Interior.

Subjects covered during the three-day period included "Priorities in Indian Health," "Tribal Concerns Over Water Rights," "Career Education and Teacher Training," "Rural Development Services," "Natural Resources," "Indian Sovereignty Issues," and "Indian Education Legislative Concerns." Two low-cost Earth terminals designed and built by the Lewis center played important roles in making the two-way, long-distance transmissions possible. One, called the portable Earth terminal, is a van-like vehicle whose equipment will broadcast and receive television and voice signals via the satellite to and from the locations around the country.

The other ground terminal is named the Transportable Earth Terminal. It is capable of receiving video and sending and receiving audio signals.

Towering Derrick—Chicago Bridge and Iron Works, prime contractor for the National Transonic Facility wind tunnel shell at NASA's Langley Research Center, recently erected this S-60 stiff-leg derrick on the construction site. Shell sections are being built in temporary buildings on the site and the derrick will lift the sections from the buildings into place. The center leg of the derrick is 31 meters tall; a 62-m long boom with a 9-m jib is attached. It can lift 90 metric tons at a radius of 54 m and 205 t at a 15-m radius. It can reach any part of the wind tunnel. The derrick will be a part of the Langley skyline until about spring 1980.

Marshall Director Named to Academy

Dr. William R. Lucas, director of the Marshall Space Flight Center, recently was elected to the National Academy of Engineering. He was cited for his "contribution to research and engineering for space vehicles and the resolution of space flight problems." Election to it honors those who have made important contributions to engineering theory and practice or unusual accomplishments in the pioneering of new and developing fields of technology.

Fuel-Saving Auto Engine Subject of NASA DOE Award Contract

NASA and the Department of Energy recently announced the signing of a contract with Mechanical Technology, Inc. (MTI) of Latham, N.Y., to develop the Stirling engine for passenger cars.

The Stirling engine has the potential of providing high fuel efficiency, flexibility of choice of fuels, inherently low noise and pollution emissions and good driving characteristics. A Stirling-powered automobile is expected to be at least 30 percent more efficient in use of fuel than current vehicles yet will give similar road performance.

The contract, awarded through NASA, provides for a major review and assessment at the end of 18 months. Maximum value of the contract which could run seven and one-half years is $95 million.

This is the second Stirling engine development contract funded as part of DOE's effort to develop alternative automobile engine systems. The first was signed with the Ford Motor Co. last September.

The two competitive engine development teams, MTI and Ford, together with various engine technology development contractors and the Stirling engine project office at NASA's Lewis Research Center, make up the DOE Stirling engine development program. The Lewis center provides project management for the DOE program and conducts supportive in-house research.

The contract with MTI calls for development of a complete Stirling engine system, engine performance data and production cost information needed by the auto industry to determine the feasibility of commercial production of the engine. Other members of the team led by MTI are United Stirling of Sweden (USS), Malmo, Sweden; and AM General, a wholly owned subsidiary of American Motors Corp., Detroit, Mich.

Under the MTI contract, three generations of Stirling engines are to be developed and tested. The baseline engine, developed earlier by USS, serves as the proven hardware starting point on which the fuel economy, performance, reliability and weight, and cost improvements are to be made, demonstrated and documented.

Approximately half the contract funds will be paid to MTI, which is responsible for program management and business development, technology transfer, component and analytical tool development and licensing. USS is responsible for developing and supplying engines and components for test and evaluation and will receive about one-third of the contract funds. The balance will go to AM General and others. AM General is responsible for engine-vehicle integration, test and evaluation, auto marketing and compiling trend information.

The contract calls for transfer of Stirling engine technology to a U.S. engine manufacturer and for royalties to be paid to the U.S. Government until more than twice the contract costs have been recovered.

New Center Director at Ames

Clarence A. Syvertson, formerly deputy director of the Ames Research Center was named director, effective April 30, 1978. Syvertson has been acting director at Ames since Dr. Hans Mark resigned in August 1977 to become Under Secretary of the Air Force.

In 1948, Syvertson began his career with NASA's predecessor agency, the National Advisory Committee for Aeronautics, as a research scientist and assistant branch chief at Ames. He became Chief of the 1.2-meter hypersonic wind tunnel branch in 1959 and from 1963 to 1966, he was director of the mission analysis division. In 1966, he was named director of aeronautics, a position he held until his appointment as deputy director of the center in February 1969.

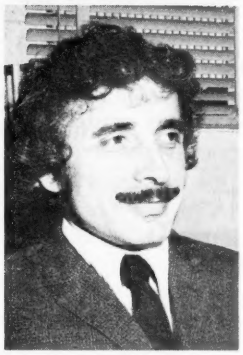
Syvertson served a year-long detail in 1970-71 with the Department of Transportation in Washington, where he was executive director of the Joint DOT-NASA civil aviation research and development policy study, for which he received the NASA Exceptional Service Medal in 1971. Earlier awards include the Lawrence Speery Award from the American Institute of Aeronautics and Astronautics and the Space Act Invention Award (shared with three others).

He was named a Fellow of the American Institute of Aeronautics and Astronautics in 1976.

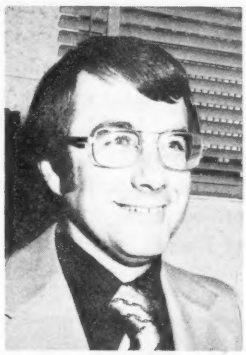
A native of Minneapolis, Minn., Syvertson received his bachelor of aeronautical engineering degree from the University of Minnesota in 1946 and a master of science degree there in 1948. He was graduated from the Advanced Management Program of Harvard Business School in 1977.

Two JPL Scientists Receive Manly Memorial Award

The Society of Automotive Engineers has honored Dr. Jose Chirivella and Wesley Menard of NASA's Jet Propulsion Laboratory with the 1977 Manly Memorial Award. The SAE award is given to the authors of the best annual paper of the year dealing with engines. It was presented at ceremonies of the International Air Transportation Meeting on May 2, in Boston, Mass.



Chirivella



Menard

Chirivella, principal investigator of the hydrogen enrichment for aircraft piston engines program, and Menard, supervisor of the combustion research group, along with Dr. Larry Duke, chief engineer at AVCO Lycoming, have introduced novel techniques in aircraft piston engines which allow fuel saving from 10 to 20 percent. These techniques are expected to appear in the general aviation market in the near future.

The research was supported by the Office of Aeronautics and Space Technology aeronautical propulsion division, headed by Harry Johnson at NASA headquarters. Concurrent with this project, Chirivella and Menard conceptually developed the Mars airplane, presently considered a strong candidate for future Mars Missions.

Ginter Retires

R. D. "Duff" Ginter, Assistant Associate, Administrator for Energy Programs, Office of Aeronautics and Space Technology, retired this month, after 28 years of government service with NASA and the United States Navy.

He continued to serve in his present capacity through the month of May—after announcing retirement plans in April—to assure a smooth transition in the management of NASA's energy programs.

NASA Administrator Dr. Robert A. Frosch said, "Ginter's leadership in developing NASA's contributions to the spectrum of modern energy issues—space solar power, photovoltaic developments, wind energy system, automotive propulsion—helped place NASA in the forefront of advanced technology applications, directly benefiting private citizens and organizations in the U.S. and worldwide."

Before joining NASA, Ginter was a missile project officer with the Navy. He began his career with NASA in 1960 when he became chief of the Scout vehicle program. Subsequently, Ginter served in a variety of positions including: director of the Centaur program, director of the technology applications division, director of the energy systems division and Assistant Administrator for Energy Programs.

He received the National Capital Engineers Award in 1963 and in 1966 NASA's Exceptional Service Medal for outstanding service as program manager of the Atlas-Centaur launch vehicle.

Born in Newton, Kan., Ginter, attended Kansas State Teachers College before earning his B.S. degree at the University of Kansas in 1948. He also attended George Washington University, Washington, D.C. as a graduate student in engineering administration.

NASA Engineer Invents Electricity Saver for Home and Industry

The billions of electric motors in use throughout the United States may be using a lot more electricity than they actually need. Frank J. Nola, a space engineer at NASA's Marshall Space Flight Center thinks that as much as 10 to 20 percent of this electricity could be saved. Maybe more. And Nola has figured out a way to do it.

The problem with AC induction motors—the kind commonly found in homes and industry—is that a healthy percentage of the power they consume is cast off in the form of heat. It is wasted. Not only that, but this process triggers similar heat losses out of transmission lines all the way back to the power station.

The electricity loss to heat is caused by current flowing through the motor and lines. The amount of this current flow is established by the fixed voltage on which the motor operates—around 125 volts in most American homes. This particular voltage is supplied by power companies because most household motors require this voltage in order to pull the heaviest loads they are intended to carry. But few run fully loaded.

"A washing machine motor may need nearly 125 volts to operate under a heavy load," Nola explained. "When it's working hard it is probably using about 430 watts of power at that voltage." Of this 430-watt figure, he says, 250 watts is doing the work and 180 watts will be lost in heat.

"When the motor runs unloaded while water is filling the washer, for example, the total power used drops to about 160 watts. But almost all that wattage is in wasted heat." Though the motor is only idling, heat loss is hardly reduced at all.

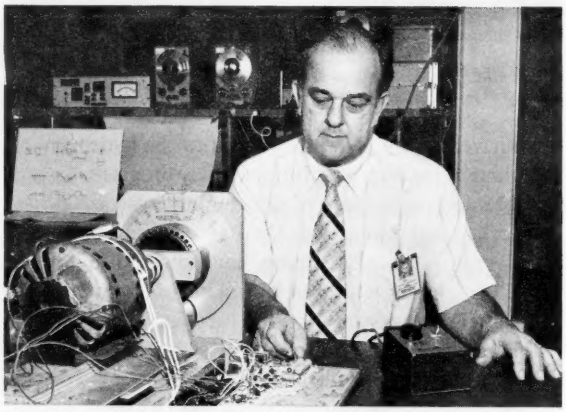
The reason, said Nola, is that even when idling along, the motor still has 125 volts applied to it, creating the same current flow and resulting heat loss as when it is working hard. But as any electrical engineer can tell you, that motor doesn't always *need* 125 volts. The voltage actually needed varies continuously with the work the motor is doing. But voltage is supplied to a house at a fixed level.

To help solve the problem Frank Nola invented an inexpensive, yet revolutionary device he calls a power factor controller. This small gadget can continuously determine the load being carried by the motor to which it is attached, by sensing shifts in the relationship between voltage and current flowing to the motor. When it senses a light load it cuts back the voltage level going to the motor to the minimum required. Current flow drops as well, which markedly reduces the wasted power going to heat loss.

With a power factor controller on the same washing machine motor described earlier, the overall power usage of an unloaded motor drops from 160 watts to about 55 watts. That is on an idling motor. Savings are less for a loaded motor, but because most motors never need the full 125 volts provided to a house, the power factor controller can still save about 8 percent of the power used even when the motor is operating under a heavy load.

The energy savings possible for bigger motors is even more dramatic. "A good example," said Nola, "would be an escalator in a department store. Its big motor always uses a relatively large amount of power to move the escalator even when only one or two people are riding it." The voltage coming in is always the amount needed to move many dozens of people. "A power factor controller would limit voltage to only that amount required to move the exact number of people using the escalator at any given time," Nola added.

Nola got the idea for his power factor controller while working on a NASA solar heating and cooling project. Most commercial solar systems available today require a number of electrically powered pumps and fans. Nola's job in the development project being conducted by NASA for the Department of Energy was to try to reduce the amount of auxilliary electrical power needed.



Electricity Hoarder—NASA engineer Frank J. Nola at the Marshall center tinkers with a gadget he invented to reduce power consumption of electrical motors used in homes and industry. His inexpensive power factor controller, seen mounted on a scrap of plywood, can cut the energy consumed by ordinary motors like the one at the left side of the photo by as much as 65 percent.

With $30 worth of parts Nola built a demonstration version of his power controller on a scrap of plywood and hooked it up to motors of the type used in millions of water pumps. Laboratory tests showed that the device reduced the amount of power used by six to eight percent while the motors were pulling normal loads, and by about *65 percent* while "idling."

The device works on any single-phase motor by simply connecting it to the wires to the motor. Many three-phase motors require only a simple modification to accept a controller.

Tests conducted by the School of Engineering at Auburn University, Ala., have already verified the feasibility of using power factor controllers on many existing household and industrial electric motors. And since a recent study made for the Federal Energy Administration reported that 64 percent of all electricity generated in the United States goes to operate electric motors, potential of the device for achieving energy savings is obviously enormous.

Patent licensing and technical information for Nola's invention is available from the Chief Counsel, CC01, Marshall Space Flight Center, Ala. 35812.

Pioneer Instrument Revived for Saturn Trip

A scientific instrument aboard Saturn-bound Pioneer 11, designed to measure the flow of the solar wind, is operating again after lying dormant for three years. The solar wind detector seems to be in good shape, and should be ready for use by the time the spacecraft encounters the ringed planet next year. Instruments aboard Pioneer are programmed to take closeup pictures and make other novel measurements.

The solar wind instrument was inoperative from 1975 to the present, despite repeated scientific efforts to revive it. Experimenters now have completed an extensive checkout program on the instrument and are confident it is in good working order.

The solar plasma analyzer maps the flow of the million-mile-an-hour solar wind—the streaming gas of ions and electrons that continuously flows out from the Sun across the solar system. The Pioneer will provide important information about the interaction of solar wind particles with Saturn and its mysterious rings. Investigators will compare these data with data gathered by the instrument three years ago when Pioneer 11 swung around Jupiter.

The instrument operated efficiently during the 21-month, billion-kilometer journey of Pioneer 11 from Earth to Jupiter, which was reached in December 1974. The spacecraft then flew up around Jupiter from pole to pole, using the planet's enormous gravitational field to help propel it high across the solar system on its way to Saturn—160 million km above the orbital planes of most of the planets. The instrument ceased operation shortly after the Jupiter encounter.

Then in October 1977, after intensive analyses of the instrument and the sending of a variety of commands (none of which worked), investigators decided to send radio commands to turn on the instrument's high voltage power source in an attempt to "thermally shock" the output circuits into operation. The effort apparently worked. Thirty-six days later, NASA tracking stations reported the first transmission of data in nearly three years. Since then the solar wind instrument has responded to all radio commands and appears to be in good working order for the Saturn encounter.

As Pioneer 11 approaches Saturn, it will slowly descend from a high arcing trajectory that enables it to see phenomena from 160 million km above the plane of the ecliptic (the plane in which the Earth circles the Sun). Pioneer 11 is presently traveling through this uncharted space—the highest above the ecliptic ever flown—dominated by the solar wind.

An important recent finding of Pioneer 11 is related to the character of the Sun's magnetic field. It appears the Sun has a simple dipole field as viewed from the perspective of the interplanetary medium far from the Sun. That is, it has a relatively simple north pole and south pole configuration (a dipole) similar to Earth's, at least in this particular phase of the solar cycle. Scientists now believe this finding of a dipole field is a basic discovery that may apply to virtually every star in the universe.

The trajectory of Pioneer 11 on its way from Jupiter to Saturn carried it through an electrical "current sheet" and into the Sun's northern magnetic hemisphere. NASA investigators discovered that the phenomenon weaves through the solar equatorial plane like a warped disc and divides the spherical space around the Sun (the heliosphere) into roughly equal northern and southern magnetic hemispheres. This heliosphere is the region filled by the solar wind surrounding the Sun and extending far beyond the Earth, at least as measured by Pioneer 11 in its odyssey through our solar system.

Life Science Experiments Sought

NASA is inviting scientists to submit proposals for life science experiments to be carried aboard the Space Shuttle and Spacelab in the early 1980's. The space agency seeks proposals for scientific investigations dealing with the physical effects of space flight on humans and other living systems, and the testing of equipment and procedures.

Life sciences opportunities are planned for the Shuttle and Spacelab during 1981, 1982 and 1983, possibly in conjunction with other scientific disciplines. Initial flights will last from 7 to 13 days. As experience with the Shuttle increases, flights may be extended.

Experiments selected as a result of the announcement will be performed in the pressurized cabin of the Space Shuttle Orbiter, in a pressurized Spacelab module, or—when experiments require continuous exposure to the environment outside the spacecraft—attached to an unpressurized Spacelab pallet.

The Shuttle and Spacelab will permit immediate followup of new findings—an important facet of any effective biological experimentation, according to Dr. David L. Winter, NASA director of life sciences programs.

Winter said that respondents to NASA's announcement of opportunity may propose investigations that meet one or more of the following life sciences objectives:

- To investigate and understand physiological, performance and biochemical changes observed in humans who have flown in space.
- To identify and investigate significant biological phenomena that may occur during or after exposure to the space environment.
- To test and demonstrate, under operational conditions, equipment and procedures needed by the NASA life sciences program.

Those who wish to submit a proposal should send a Letter of Intent to Dr. Stanley Deutsch, Director, Life Sciences Payloads and Applications, Code SBE-3, NASA Headquarters, Washington, D.C. 20546. Deadline for proposals is June 30, 1978.

Contractor News

The IBM Corporation's Houston office signed a $10.3 million supplemental agreement with NASA's Johnson center covering design, development and implementation of ground-based computing and data processing system software at the center. Estimated total cost of the supplement is some $50 million.

Pratt and Whitney Aircraft of West Palm Beach, Fla. recently won a $1.2 million contract with NASA's Lewis center to provide RL10 engine support for the Centaur launch vehicle. The cost-plus-fixed-fee contract will run for a year, to April 1, 1979, with an option for an additional year. Work will be performed at the contractor's plant in West Palm Beach and at the General Dynamics/Convair plant in San Diego.

The General Electric Co. of Cincinnati has been awarded a NASA contract for $83.3 million to develop advanced technology to improve the fuel efficiency of future turbofan engines for commercial airline use. Options associated with the contract could raise the total value to nearly $100 million. The engine technology effort is a major part of the energy efficiency engine project, an element of the NASA aircraft energy efficiency program. A similar technology development contract is being negotiated with the Pratt and Whitney Aircraft group of the United Technologies Corp., East Hartford, Conn.

The Rocketdyne Division of Rockwell International Corp. recently signed a $1.8 million contract with NASA's Lewis center to provide MA-5 engine and MA-5/MA-3 common engineering and logistics support and spare parts for the Atlas launch vehicle. The work, which began April 1, will be performed at the contractor's plants at Canoga Park and San Diego, Calif.

The Bendix Field Engineering Corp. of Columbia, Md. has been selected by NASA's Goddard center for negotiation of a contract to operate and maintain payload and operations control centers. The estimated cost of the contract is about $16 million. The centers involved serve as focal points for the various teams and individuals who "fly" orbiting, unmanned spacecraft, monitoring conditions, attitude and orbit, and remotely controlling them, as well as sending commands for various experimental activities. The centers operate 24 hours a day, 7 days a week, under the direction of a control center operations manager who is a member of the Goddard project operations branch. The contractor employs about 450 people, most of them stationed at the Goddard center.

SDC Integrated Services, Inc. of McLean, Va. has been selected for negotiation leading to award of a contract to provide support services for the operation of the digital computer complex at NASA's Langley center. The value of the 2-year base period of the contract is estimated at about $5.7 million. Work begins June 8, 1978, to be managed by NASA's Langley center.

Teledyne Brown Engineering of Huntsville, Ala. has won a Spacelab payload missions integration contract with an estimated value of $7.3 million. Initial funding is for some $2 million. Teledyne will work under management of the Marshall center for the first three Spacelab missions.

The International Hydrodynamics Co., Ltd., of British Columbia has been awarded a contract by the Kennedy center for production of recovery systems for expended Shuttle solid rocket booster casings in the amount of some $1 million.

The Vought Corp. of Dallas has won a contract to provide five Scout launch vehicles to NASA. The contract is valued at about $5 million and will be managed by NASA's Langley center. Vought has been the Scout project's prime contractor since 1959. Scout vehicles are launched from Wallops Island, Va.; Vandenburg Air Force Base, Calif.; and San Marco, Kenya, Africa.

The University of Florida has been awarded a $99,000 contract by NASA's Kennedy center to study the development of a water management system using satellite data and other NASA-developed technology. Participating in the project are Florida's five water-management districts as well as personnel from the center's applications office.

Good Samaritan—Jim Fay received a 12-gallon pin from the American Red Cross when the Bloodmobile visited the Langley Research Center in March. Fay, who works in the personnel division, has been donating blood for more than 26 years. A total of 301 pints were donated by Langley employees on March 22, topping the previous record of 292 pints set in June 1977.

Did You Know?

A six-month space science exposition begins in Tokyo in mid-July. The theme of the $21 million project is "Space—Dream and Hope for Humanity." One of the four pavilions will be dedicated entirely to the Apollo project. U.S. space hardware on display will include a Saturn 1B rocket, a Mercury-Redstone, F-1 and J-2 rocket engines from the Saturn V moon rocket, Mercury, Gemini and Apollo spacecraft, a full-scale mockup of the Viking Mars lander, and a one-third scale model of the Space Shuttle orbiter.

Jack A. Kinzler, technical services division chief at NASA's Johnson Space Center, was one of 10 finalists in the "Federal Retireee of the Year" awards competition. The finalists received plaques marking the event in Washington, D.C. on May 31. According to his citation, Kinzler has made exceptional contributions to the U.S. space program during 16 years with NASA. Among his many achievements, perhaps the most significant was his deadline conception, invention and fabrication of the parasol-like emergency sunshield that saved the Skylab mission.

The German Federal Ministry for Research and Technology has announced that its budget for fiscal year 1978 is $2.4 billion, of which $234.6 million is for space and aeronautics research, including a $180 million contribution to ESA.

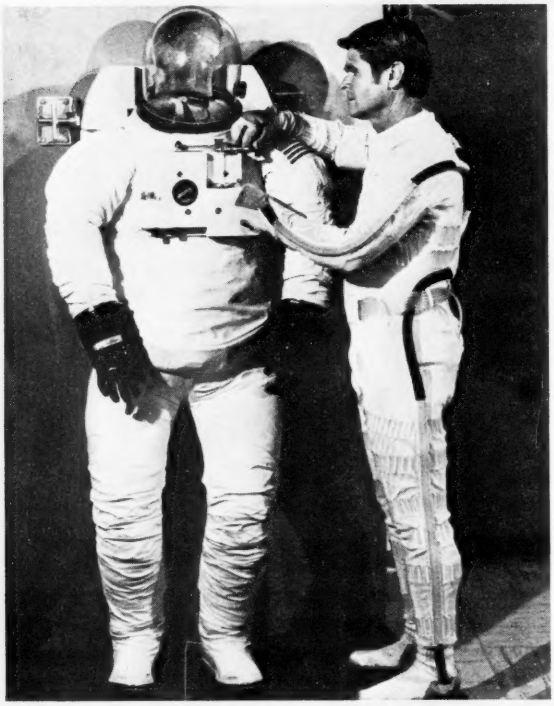
Former astronaut Michael Collins was appointed Under Secretary of the Smithsonian Institution in April. Collins was one of the third group of astronauts selected by NASA in 1963. He piloted the Gemini spacecraft in 1966, and he was command module pilot during the historic Apollo 11 flight in July 1969. He remained in Lunar orbit while Neil Armstrong took the first steps on the Moon. Collins left NASA in 1970; in 1971 he was appointed director of the Smithsonian's National Air and Space Museum.

A Japanese company, under license from NASA, is marketing a space-age, freeze-dried rice. The produce involves freezing the rice twice instead of only once. For unexplained reasons, the process makes the rice tasty and firm when mixed with mere tap water instead of the usual boiling water.

Update on Space Shuttle Schedule

Since 1973, the first manned orbital flight has been officially scheduled for the second quarter in 1979. An internal NASA working schedule of March 1979 was set the same time.

Most of the major elements of the program are between two and three months behind the target schedule of March 1979 but are still able to meet the commitment schedule of June 1979. The one element of the system which could cause the June date to slip is the main engine. Though the June date allows sufficient time to complete the engine hardware and necessary engine development and qualification tests, it does not allow any slack for additional major main engine test failures. The Space Shuttle main engine tests scheduled between May and September 1978 should provide NASA with sufficient insight on potential engine problems to reschedule in September 1978, if a rescheduling is required.



Shuttle Spacesuit—An engineer demonstrates the new Shuttle extravehicular mobility unit (at left) as he models the liquid cooling and vent garment designed to be worn under the spacesuit. The clear plastic tubes are for water circulation and the larger dark tubes are for gas circulation.

New Special Assistant to the NASA Chief Engineer

Leonard Jaffe became special assistant to the NASA chief engineer effective April 24, 1978. As such, Jaffe will support the functions of the office.

Jaffe joined NACA, the predecessor organization of NASA in 1948 as an aeronautical research scientist at the Lewis Flight Propulsion Laboratory in Cleveland, Ohio.

From June 1969 to December 1971, he was Deputy Associate Administrator for Space Science and Applications. For three years before that, he was director of space applications programs in the NASA Office of Space Science and Applications. In that position, he was responsible for the direction of research and development for communications satellites, meteorological satellites, and geodetic satellites, as well as natural resources efforts, and the study programs for navigation and traffic control satellites. Previously, as director of communication and navigation programs, he directed the establishment of programs for the development of the Echo, Relay, and Syncom satellites and the Applications Technology Satellites which ushered in the era of commercial communications satellites.

In his most recent position as Deputy Associate Administrator for Space Applications, Jaffe was responsible for the NASA continuing program of development of all satellite applications to Earth needs, including those pertaining to weather, climate Earth resources, Earth and ocean dynamics, and space processing as well as communications.

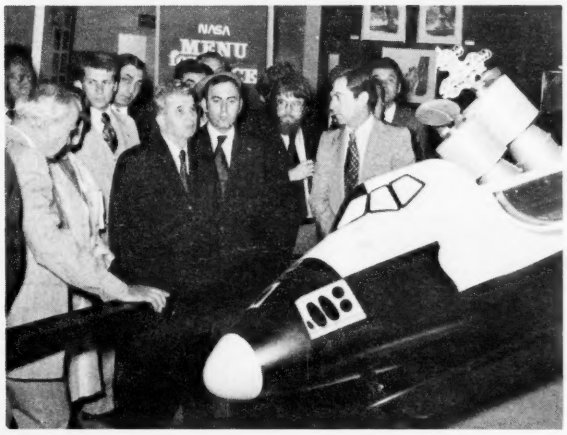
In addition to changing jobs in April, Jaffe was honored by the American Institute of Aeronautics and Astronautics when he became the recipient of the AIAA Aerospace Communications Award. The award, conferred biennally "for a person who has made an outstanding contribution in the field of aerospace communications," was presented to Jaffe at San Diego on April 25. His citation read:

"For significant and sustained contributions to the development of technology for communications satellites resulting in the operational employment of satellites for global communications services."

Patents for Inventions from NASA Research

The Office of General Counsel, NASA Headquarters, announces that the following U.S. patents have been issued by the U.S. Patent Office to NASA for inventions resulting from NASA research. Inquiries concerning them should be directed to the attention of the NASA Patent Counsel of the indicated installation.

Inventor(s) and Employer	Title	Patent No.	Installation
Walt C. Long, Milton C. Williams } NASA/LaRC	Non-destructive method for applying and removing instrumentation on helicopter rotor blades.	4,082,001	LaRC
John C. Evans, Jr., NASA/LeRC	Solar cell collector	4,082,569	LeRC
Americo F. Forestieri, Evelyn Anagnostou, } NASA/LeRC	Method of making encapsulated solar cell modules.	4,083,097	LeRC
Charles C. Rupp, Ralph R. Kissel } NASA/MSFC	Tetherline system for orbiting satellites	4,083,520	MSFC
Daniel D. Lawson, NASA/JPL, Pasadena, Calif.	Polymeric electrolytic hygrometer	4,083,765	NRLO
Robert E. Kapustka, NASA/MSFC	Method and apparatus for conditioning of nickel-cadmium batteries.	4,084,124	MSFC
David L. Trowbridge, NASA/JPL, Pasadena, Calif.	Swept group delay measurement	4,084,132	NRLO
Lawrence P. Ludwig, NASA/LeRC, Fairview Park, Ohio	Counter pumping debris excluder and separator.	4,084,825	LeRC
Arthur P. Adamson, GE, Cincinnati, Ohio	Gas turbine engine with recirculating bleed	4,083,181	LeRC
Craig D. Sawyer, NASA/JPL, Pasadena, Calif.	Control for nuclear thermionic power source	4,085,004	LeRC
Edward F. Baeks, NASA/LeRC	Flow compensating pressure regulator	4,084,612	LeRC
Dean W. Sheibley, NASA/LeRC	Inorganic-organic separators for alkaline batteries.	4,085,241	LeRC
John C. Evans, Jr., NASA/LeRC	Method for producing solar energy panels by automation.	4,084,985	LeRC
Horst E. Wilhelm, University of Colorado, Fort Collins	Extraction and separation of a preferentially photodissociated molecular isotope into positive and negative ions by means of an electrical field.	4,085,332	LeRC

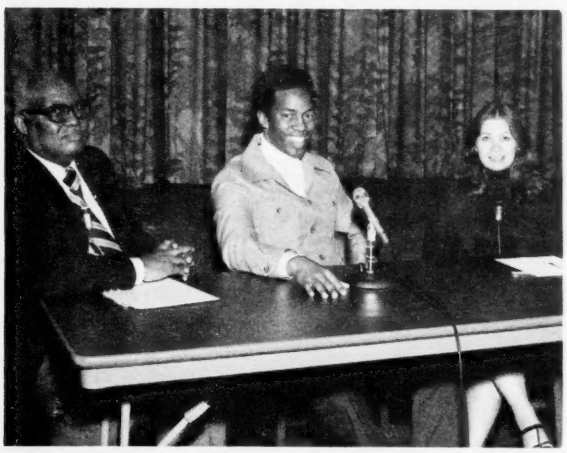


Foreign Leader Learns about American Space Plan— Romanian President Nicolae Ceausescu, standing to the left of the Johnson center's deputy director Sigurd Sjoberg (light suit, leaning on railing), is briefed on the Space Transportation System by Astronaut John Young (light suit, at Ceausescu's left). Ceausescu also visited the Mission Control Center and the Shuttle crew training facilities at JSC.

Launches for 1978—Completed and Projected

Name	Launch Date	Vehicle	Range	Mission Remarks
Intelsat IVA-(F3)	Jan. 7	Atlas-Centaur	ETR	Improved communications satellite for Comsat. Reimbursable.
IUE-A	Jan. 26	Delta	ETR	International Ultraviolet Explorer—cooperative with ESA. Designed to obtain high resolution data on stars and planets in the ultraviolet region of the spectrum.
FLTSATCOM-A	Feb. 9	Atlas-Centaur	ETR	Navy fleet satellite communications. Reimbursable.
Landsat-C	March 5	Delta	WTR	Third Earth resources technology satellite.
Intelsat IVA-F6	March 31	Atlas-Centaur	ETR	Improved communications satellite for Comsat. Reimbursable.
Japan/BSE-A	April 7	Delta	ETR	Broadcasting satellite experimental. Japanese communications satellite for conducting TV broadcast experiments. Reimbursable.
AEM-1 (HCMM)	April 26	Scout	WTR	Heat capacity mapping mission to produce thermal maps for thermal intertial measurements, investigate feasibility of geothermal source location by remote sensing, and provide coverage of snow field for water runoff prediction.
OTS-B	May 11	Delta	ETR	ESA orbital test satellite.
Pioneer Venus-A	May 20	Atlas-Centaur	ETR	Planetary mission to Venus. Orbiter will measure upper atmosphere and ionosphere, study interaction between solar wind and ionosphere and magnetic field, study atmospheric and surface characteristics, determine gravitational field harmonics.
Seasat-A	June	Atlas-F	WTR	Sea satellite for global monitoring of ocean geoid, wave topography, surface wind speed and direction, ocean surface temperature, and ice field extent and dynamics.
NOAA/ GOES	June 16	Delta	ETR	Part of global network of geostationary environmental satellites to provide Earth imaging, monitor the space environment, and relay meterological data to users. Reimbursable.
Comstar-C	June 29	Atlas-Centaur	ETR	Third in a series of domestic communications satellites for Comsat. Reimbursable.
ESA/GEOS-B	July 14	Delta	ETR	ESA spacecraft to conduct scientific, investigation of waves and particles in magnetosphere. Reimbursable.

ISEE-C	July	Delta	ETR	International Sun Earth Explorer. An extension of interplanetary studies with the spacecraft toward the Sun sufficiently outside the Earth's influence for comparison with results of ISEE-A and B missions and of space probes to outer planets.
Pioneer Venus-B	Aug. 7	Atlas-Centaur	ETR	Multiprobe—will determine nature and composition of clouds, composition structure and general circulation pattern of the atmosphre of Venus from the surface to high altitudes, study interaction between planetary environment and interplanetary medium.
Nimbus-G	Aug. 12	Delta	WTR	Develop and flight test advanced sensors and technology basic to conducting experiments in the pollution monitoring, oceanographic, and meteorological disciplines.
TIROS-N	Aug. 17	Atlas-Centaur	WTR	Polar orbiting operational spacecraft to provide and improve meteorological data for NOMSS and provide support to GARP.
Japan Backup	Sept.	Delta	ETR	Backup spacecraft for Japan.
Navy-20	Sept.	Scout	WTR	Navy navigation satellite. Reimbursable. (Call-up.)
NOAA-A	Sept.	Atlas-F	WTR	Advanced operational prototype spacecraft and sensors for a third generation series of operational meteoroligical satellites. Reimbursable.
NATO III-C	Oct.	Delta	ETR	Communications satellite, second in series.
HEAO-B	Oct.	Atlas-Centaur	ETR	Second high energy astronomical observatory to study highly energetic radiation from space.
Telsat-D	Nov.	Delta	ETR	Canadian domestic communications satellite. Reimbursable.
FLTSATCOM-B	Dec.	Atlas-Centaur	ETR	Navy fleet satellite communications. Reimbursable.



Shuttle Astronaut Visitor—Newly selected Space Shuttle astronaut Major Guion Bluford visited NASA's Lewis Research Center in May. He is shown here with George Pope (left) and Lindy Perks during an interview which was videotaped for use in the Lewis visitor information center. The videotape will be shown to groups of school children visiting the center. During his two day visit, Bluford also conducted interviews with radio and newspaper reporters, appeared on the "Afternoon Exchange" program, a locally produced live television interview program, and taped an interview for the nationally televised "Black on Black" program. He also served as keynote speaker at the opening of a three-day Lewis seminar designed to interest junior and senior high-school students in the science and engineering career fields.

Another Dividend from Air and Space

Research and development in aeronautics and space have provided numerous benefits for all Americans—and at a tiny percentage of the tax dollar. Here is an example:

Instant Eyeglass Prescription

"In the drive to meet its objectives, the space program has become the cutting edge of technology," observed Dr. William R. Lucas, director of NASA's Marshall Space Flight Center, "and the resulting advances in technology are touching practically every area of life."

Consider the typical eye examination, which an estimated 60 million Americans undergo each year. The doctor asks a patient to look at the eye chart, and then spends several minutes asking numerous questions sometimes difficult for the patient to answer precisely.

This century-old, trial-and-error technique is rapidly giving way to a new examining procedure which utilizes an electro-optical "eye-computer" called the "6600 Auto-Refractor." A patient simply peers into a small window at one end of the instrument. Then, at the press of a button, a rotating beam of near-infrared light is projected onto the retina at the rear of the patient's eye, while a mini-computer calculates the eye's "refractive error" and prints out the optimum prescription to correct the patient's vision. All this is done in just one and one half seconds.

The device contributes the type of precise objectivity that has heretofore been lacking in the refractive examination, eliminating possible guesswork in the patient's answers. Because the unit is completely automated, it can be operated by an office assistant, freeing the doctor for more complex technical and medical services.

Stanford Research Institute developed the original unit under a grant from NASA's Ames center, funded by NASA's Technology Utilization Office, to measure the visual performance of pilots. It was a servo-controlled infrared device for determining the eye's focus.

In a classic case of "technology transfer," Acuity Systems, Inc. of Reston, Virginia employed Dr. Tom N. Cornsweet, who had worked at Stanford to further refine and expand the instrument's capabilities to meet the needs of the average eye care professional. The result was the 6600 Auto-Refractor, which is now helping over 3,000 ophthalmologists and optometrists provide better care to their patients in over 30 countries.

Recently the company successfully introduced a companion instrument primarily designed for the optician and optical manufacturing members of the eye care profession. This objective, push-button instrument is called, naturally enough, the Auto-Lensmeter.

By combining a patented laser ray-path analyzer with a micro-computer, Acuity Systems has made it possible to instantaneously measure the optical power of a prescription lens—either unmounted, in frames, or "contacts." The instrument measures to a level of accuracy beyond human duplication, and replaces a slow and operator-subjective process which was causing the optical industry millions in production spoilage.

The 6600 Auto-Refractor, Acuity Systems' original product, is used by thousands of eye-care practitioners in more than 30 countries. It performs an objective refraction in less than two seconds and is designed for operation by an office assistant.

NASA
National Aeronautics and Space Administration